

NON-PUBLIC?: N
ACCESSION #: 9004240261
LICENSEE EVENT REPORT (LER)

FACILITY NAME: JAMES A. FITZPATRICK NUCLEAR POWER PLANT PAGE: 1
OF 5

DOCKET NUMBER: 05000333

TITLE: Reactor Scram - Loose Part in Water Level Recorder Amplifier
Resulted in Ground and False Low Water Level Signal Causing Real
High Water Level and Turbine Trip
EVENT DATE: 03/19/90 LER #: 90-009-00 REPORT DATE: 04/16/90

OTHER FACILITIES INVOLVED: DOCKET NO: 05000

OPERATING MODE: N POWER LEVEL: 100

THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR
SECTION:
50.73(a)(2)(iv)

LICENSEE CONTACT FOR THIS LER:
NAME: Hamilton C. Fish TELEPHONE: (315) 349-6013

COMPONENT FAILURE DESCRIPTION:
CAUSE: B SYSTEM: SJ COMPONENT: AMP MANUFACTURER: GO82
REPORTABLE NPRDS: Y

SUPPLEMENTAL REPORT EXPECTED: NO

ABSTRACT:

EIIS Codes are in !

The reactor scrammed from full power at 3:54 P.M. on 3/19/90. A false low reactor water level signal in the feedwater control circuit JB! increased feed pump speed. This resulted in high reactor water level followed by a turbine trip and automatic reactor scram initiated by turbine stop valve closure SB!. All systems performed as designed except for flow oscillations in the High Pressure Coolant Injection system (HPCI) BJ! (LER-90-010) and one rod inserting only to position (02). HPCI injection was, continued using manual operator control. A normal plant cooldown followed. The cause of the scram was an oversight by the vendor in the assembly of the amplifier component (purchased 10 years ago) of the strip chart recorder for narrow range water level. A

one-quarter inch metal star lock washer was found wedged between the printed circuit board and the mounting track groove in the metal amplifier box. The washer was also in contact with a signal wire on the board. The resulting electrical ground created a short circuit to an installed ground on the feedwater level control circuit and a false low reactor water level signal. The plant was returned to service with the generator on line at 8:27 P.M. on March 23, 1990.

END OF ABSTRACT

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EIIS Codes are in !

Description

The reactor scrammed from full power at 3:54 P.M. on March 19, 1990. One of the four Residual Heat Removal (RHR) BP! pumps was out of service for maintenance. Prior to the scram the reactor water level was at a normal value of 200 inches above Top of Active Fuel (TAF). The strip chart recorder (06LR/PR-97) for reactor pressure and narrow range (164.5 to 224.5 inches TAF) reactor water level was being installed in the reactor control panel (09-5) following replacement of a signal amplifier. Upon connection of the recorder, a false low reactor water level signal was generated in the reactor feedwater level control circuit JB!. In response to this signal the master controller increased feed pump speed. Reactor water level rapidly increased to a maximum of 238 inches TAF resulting in trip of the main turbine and reactor feedwater pumps at 222.5 inches. The main turbine stop valve SB! closure generated a scram signal to the reactor protection system JC!. High water level trip logic was also activated for the High Pressure Coolant Injection (HPCI) BJ! and Reactor Core Isolation Cooling (RCIC) BN! systems although they were not operating at that time.

The reactor reached 1130 psig during the transient. In accordance with design, two safety relief valves lifted and two more may have simmered but did not lift. Also in accordance with design, both reactor recirculation pumps AD! tripped and the signal for alternate rod insertion was received.

The high water level trip of the feedwater pump turbines was followed by a rapid decrease in reactor water level to 131 inches TAF. The low reactor water level resulted in an automatic Group II primary containment isolation, isolation of the Reactor Water Cleanup system (RWC) CE!, trip of the reactor building ventilation system VA!, and initiation of the Standby Gas Treatment system (SBGT) BH!, automatic initiation of and

injection into the vessel by HPCI BJ! and RCIC BN!. Because the initial automatic flow control response of HPCI was erratic (LER-90-010), operators placed it in manual control to restore reactor water level. Both HPCI and RCIC subsequently tripped on high reactor water level in accordance with design. The operators restarted reactor feed pump A to maintain reactor water level.

Following the scram procedure, operators verified the Group II primary containment isolation and then restored the RWC and reactor building ventilation system to service. During verification of insertion of control rods, control rod AA! 30-07 was found at position 02 instead of full in at position 00. It was then fully inserted manually. The discharge check valve (34FWS-4B) for reactor feed pump B stuck in the open position. A normal plant cooldown was initiated to accommodate restart of the reactor recirculation pumps.

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Upon determination of the cause and correction of the erratic response of HPCI (LER-90-010), the plant was restored to service with generator on line at 8:27 P.M. on March 23, 1990. The plant was off line for 4 days, 4 hours, 33 minutes.

Cause

A one-quarter inch outside diameter serrated metal star lock washer was found firmly wedged between a contact point on the circuit board and the circuit board mounting track groove in the metal amplifier box. Thus, the lock washer created an unintended conductive path from the amplifier to the metal amplifier case. The box in turn was connected to the recorder frame for the reactor pressure and level dual pen strip chart recorder. When the recorder assembly was reconnected to the water level control circuit at the control room panel, a shunting ground path was established between the recorder terminal case and an installed ground at a proportional amplifier in the reactor water level control system.

The effect of the ground was to create a short circuit across the signal input to the master controller. This in effect provided a reactor water level signal of zero to the feedwater controller. As previously described, this resulted in maximum feed pump output, high reactor water level, and scram of the reactor on turbine stop valve closure.

The performance of one of the pens on the dual pen recorder had been erratic which was symptomatic of a failing amplifier. Two amplifier sections were installed to replace the existing amplifiers. The replacement amplifiers were from existing inventory. Standard tests of

the amplifier performance were conducted prior to installation by use of the external multi-pin connectors. These tests indicated proper operation of the amplifier. Individual pin to case ground tests which might have found the ground are not normally performed on this type of component. The metal covers on amplifier boxes had not been opened.

The replacement amplifier unit was a component of a dual pen indicating recorder received on August 6, 1980. The recorder was ordered as Quality Assurance (QA) Category I. Although the manufacturer provided a "Product Quality Certification", it was listed as "not important to safety" on the other vendor documentation. The recorder was inspected upon receipt to specifications for physical damage, cleanliness, physical properties, and workmanship. It was carried in the warehouse QA Category I inventory until it was issued to the Instrument and Control Department on July 27, 1988. Since that time, the recorder has served as a source of immediate replacement parts for compatible installed plant recorders. Both new amplifier units were removed and used to replace the two amplifier sections (one for each pen) in the in-service recorder. The amplifier case cover remained securely closed and was secured by a thumbscrew during this ten-year period.

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The washer which caused the scram is identical to those used internally to fasten the multi-pin connector to the amplifier box. However, all connections in the box were found to be tight. No other parts were missing or loose. Therefore, the washer causing the ground is believed to have been in place since assembly of the device by the manufacturer.

Analysis

As an automatic scram, this event is reportable under the provisions of 10 CFR 50.73(a)(2)(iv) which requires reporting of any event or condition that resulted in a manual or automatic actuation of any Engineered Safety Feature. The chain of events is provided in the description section.

FSAR Section 14, "Safety Analyses", Subsection 14.5, "Analysis of Operational Transients and Reactor Vessel Overpressure", was reviewed. The plant responded as designed for a normal turbine trip (with bypass) due to reactor vessel high water level. Vessel pressure and level control were maintained within acceptable ranges.

Failure of control rod 30-07 to fully insert automatically, erratic response of the HPCI system, and failure of 34FWS-4B to seat on reverse flow, had no detrimental effect on the course of the plant response to

the scram.

The one control rod which did not completely insert automatically was subsequently fully inserted manually. The rod had automatically inserted to notch position 02. Experience has demonstrated that a small number of control rods in BWR plants will occasionally fully insert and then bounce back out to position 02. The reactivity represented by this single rod being at the first notch position is such that even if it had not been successfully inserted manually, sufficient shutdown margin would have been maintained and there would have been no safety consequences to the plant.

Corrective Action

Prior to the scram the performance of one of the two recorder pens was symptomatic of a deteriorating amplifier. As a prudent practice, the amplifiers for both pens were replaced. Following the scram, the amplifier containing the ground was removed and replaced with the original amplifier which had not been exhibiting deteriorating performance. Replacement parts are no longer available from the manufacturer.

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Defective Component Data

Manufacturer: General Electric Company
Manufacturer Vendor Code: G082
Model: 109SK66701 (Amplifier)
Description: Signal Amplifier Circuit Board
Applications: Strip Chart Recorder
Reactor Water Level and Pressure
JAF Component: 06LR/PR-97 (Strip Chart Recorder)

ATTACHMENT 1 TO 9004240261 PAGE 1 OF 1

James A. FitzPatrick
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NewYorkPower William Fernandez II
Authority Resident Manager

April 16, 1990

JAFP-90-1328

United States Nuclear Regulatory Commission
Document Control Desk
Mail Station P1-137
Washington, D.C. 20555

SUBJECT: DOCKET NO. 50-333
LICENSEE EVENT REPORT: 90-009-00
Reactor Scram - Loose Part in
Instrument Amplifier

Dear Sir:

This Licensee Event Report is submitted in accordance with 10 CFR
50.73(a)(2)(iv).

Questions concerning this report may be addressed to Mr. Hamilton Fish
at (315) 349-6013.

Very truly yours,

WILLIAM FERNANDEZ

WF:HCF: 1ar

Enclosure

WF:HCF:1ar

Enclosure

cc: USNRC, Region I
USNRC Resident Inspector
INPO Records Center
American Nuclear Insurers

*** END OF DOCUMENT ***
